

1. A low-profile vernier x-y-theta substrate chuck for mounting to the vacuum-equipped movable platform of a high-resolution stage for multi-exposure projection lithography on a substrate of greater area than the area of the substrate chuck,

characterized by:

- a) an x-bracket which serves as a mounting frame and has multiple supporting means and locating surfaces for other elements;
- b) x-bracket adjustment means mounted on said x-bracket;
- c) an x- y-bracket, having a slideway, mounted operatively to said
10 x-bracket;
- d) a y, theta bracket, mounted slidably in said slideway of said x-y bracket, said y, theta bracket having a central yaw shaft opening and vacuum channel;
- e) a yaw shaft fitted within said yaw shaft opening;
- f) y-bracket adjustment means;
- g) a configured yaw vacuum diffuser bracket having a top plane defining a substrate support, having a number of support islands providing a multiple support plane for a vacuum diffuser plate; and having a peripheral channel, with support islands and peripheral channel having a depth
20 appropriate for holding a vacuum diffuser plate flush with said support plane;
- h) a vacuum diffuser plate, mounted to said vacuum diffuser bracket; and
- i) adjustment means, for x, y and theta adjustment while mounted on the movable platform of said high resolution stage.

2. a low-profile vernier x-y-theta substrate chuck according to claim 1, wherein said vacuum diffuser plate is cemented to said support islands and to said peripheral channel with its surface co-planar with said top plane.

3. A low-profile vernier x-y-theta substrate chuck according to claim 1, wherein said adjustment means is operable while said substrate chuck is mounted on said high resolution stage.

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4. A low-profile vernier x-y-theta substrate chuck according to claim 1, wherein said adjustment means includes x, y and theta adjustability operable while said substrate chuck is mounted on said high resolution stage.

5. A low-profile vernier x-y-theta substrate chuck according to claim 1, wherein said adjustment means includes x and y pre-load means and x and y adjustment screws operable while said substrate chuck is
20 mounted on said high resolution stage.

6. A low-profile vernier x-y-theta substrate chuck according to claim 1, wherein said adjustment means includes x and y pre-load means and x, y, and theta adjustment screws operable while said substrate chuck is mounted on said high resolution stage.

7. A low-profile vernier x-y-theta substrate chuck according to claim 1, wherein said adjustment means includes x and y pre-load means and \bar{x} , y, and theta adjustment screws operable while said substrate chuck is mounted on said high resolution stage, and includes a yaw shaft and a central support spring for said yaw vacuum diffuser bracket, and also includes vacuum channel means juxtaposed with said yaw shaft.

8. A low-profile vernier x-y-theta substrate chuck having a rigid high-flatness vacuum diffuser plate co-planar with the top plane of a substrate support x - bracket having a number of diffuser plate support islands, a peripheral diffuser plate support channel, and means to provide x, y and theta alignment adjustment while mounted on a flat surface of area significantly greater than its area, made by the following method:

Step 1. Dispensing a bead of epoxy cement in the peripheral channel and dispensing beads of epoxy cement on the islands ;

Step 2. Placing a diffuser plate within said peripheral channel of said x-bracket with sufficient force to deform said beads of epoxy cement so as to make a pre-assembly with the surface of said diffuser plate and top plane non-co-planar;

20 Step 3. Flipping the pre-assembly over onto a high-flatness rigid plate;

Step 4. Shaking said pre-assembly to co-planar juxtaposition of the vacuum diffuser plate and top plane of the x-bracket; and

Step 5. Letting the epoxy cure.